

What is claimed is:

1. A semiconductor device comprising:

a substrate and an electrode formed on the substrate,

5 wherein a through-hole is formed through the electrode and the substrate in a stacking direction of the electrode and the substrate, a conductive member being inserted into the through-hole,

wherein an insulating material is disposed between the electrode and the conductive member, the insulating material including a wall portion located higher than 10 at least the electrode, and

wherein the conductive member is formed over the wall portion of the insulating material from the through-hole and is connected with the electrode.

2. The semiconductor device as defined in claim 1,

15 wherein the insulating material is formed to cover an upper surface of the electrode and a surface in the through-hole, and includes a connection hole for connecting at least the electrode with the conductive member at a position differing from the through-hole, the wall portion being disposed between the connection hole and the through-hole.

20

3. The semiconductor device as defined in claim 1,

wherein at least an interlayer dielectric is formed between the substrate and the electrode, the through-hole being formed in the interlayer dielectric, and surfaces of the interlayer dielectric and substrate in the through-hole are formed to have a level 25 difference in a boundary area between the substrate and the interlayer dielectric.

4. The semiconductor device as defined in claim 1,

wherein at least an interlayer dielectric is formed between the substrate and the electrode, the through-hole being formed in the interlayer dielectric, and surfaces of the interlayer dielectric and substrate in the through-hole are formed straightly in a boundary area between the substrate and the interlayer dielectric.

5

5. The semiconductor device as defined in claim 1,

wherein the conductive member functions as a connection terminal which secures electrical connection in an axial direction of the through-hole.

10

6. The semiconductor device as defined in claim 1,

wherein a part of the conductive member projects outward from the through-hole on a side of the substrate opposite to a side on which the electrode is formed.

15

7. A semiconductor device comprising a plurality of the semiconductor devices as defined in claim 1 which are stacked, each of the semiconductor devices being electrically connected through the conductive members.

8. A circuit board comprising the semiconductor device as defined in claim 1.

20

9. An electronic instrument comprising the circuit board as defined in claim 8.

25

10. A method of manufacturing a semiconductor device, comprising:
a stacking step of forming an electrode on a substrate;
an electrode hole formation step of forming an electrode hole in the electrode, the electrode hole exposing a surface of the substrate;
a step of forming an insulating layer so as to cover at least a surface in the

electrode hole and an upper surface of the electrode;

5 a step of forming an opening in the insulating layer inside the surface in the electrode hole at a position corresponding to a substrate hole forming section;

10 a step of forming a substrate hole in the substrate using the insulating layer as a mask, the substrate hole being connected with the electrode hole;

15 a connection hole formation step of exposing the upper surface of the electrode by forming a hole in the insulating layer in a region differing from the electrode hole; and

20 a conductive member filling step of filling the electrode hole, the substrate hole, and a connection hole in the insulating layer with a conductive member continuously from inside of the electrode hole and the substrate hole to the electrode that has been exposed.

11. The method of manufacturing a semiconductor device as defined in claim

15 10,

wherein the stacking step further includes a step of forming an insulating film on the electrode, and

20 wherein the electrode hole formation step includes a first step of forming an opening in the insulating film formed to cover the electrode in at least a part of an area located on the electrode, and a second step of forming the electrode hole by forming an opening in a part of the electrode using the insulating film in which the opening is formed as a mask.

12. The method of manufacturing a semiconductor device as defined in claim

25 10,

wherein the substrate hole and the electrode hole are formed to have approximately the same diameter.

13. The method of manufacturing a semiconductor device as defined in claim 10,

wherein a diameter D1 of the substrate hole and a diameter D2 of the electrode hole satisfy the relationship $D1 < D2$.

14. The method of manufacturing a semiconductor device as defined in claim 11,

wherein a diameter D1 of the substrate hole, a diameter D2 of the electrode hole, and a diameter D3 of the opening in the insulating film satisfy the relationship $D1 < D2 < D3$.

15. The method of manufacturing a semiconductor device as defined in claim 10, comprising a semiconductor device stacking step of stacking a plurality of semiconductor devices obtained by using the manufacturing method as defined in claim 10 through conductive members of the semiconductor devices.